README for Plug Load Data

We provide MATLAB binary files (.mat) and comma separated values files of data collected from a pilot study of a plug load management system that allows for the metering and control of individual electrical plug loads. The study included 15 power strips, each containing 4 channels (receptacles), which wirelessly transmitted power consumption data approximately once per second to 3 bridges. The bridges were connected to a building local area network which relayed data to a cloud-based service. Data were archived once per minute with the minimum, mean, and maximum power draw over each one minute interval recorded. The uncontrolled portion of the testing spanned approximately five weeks and established a baseline energy consumption. The controlled portion of the testing employed schedule-based rules for turning off selected loads during non-business hours; it also modified the energy saver policies for certain devices.

Three folders are provided: "matFilesAllChOneDate" provides a MAT-file for each date, each file has all channels; "matFilesOneChAllDates" provides a MAT-file for each channel, each file has all dates; "csvFiles" provides comma separated values files for each date (note that because of data export size limitations, there are 10 csv files for each date). Each folder has the same data; there is no practical difference in content, only the way in which it is organized.

The MAT-file format is similar in both folders. Each file contains two variables: 'data' and 'header'; 'header' is a description of the columns in 'data'. The MAT-files in "OneChAllDates" also has a variable 'fileInd', which is an array that contains the row indices of 'data' that mark a new date (e.g., data(fileInd(1):fileInd(2)-1,:) is all data for the first date). Here are the column headers with a description and example:

Column Header	Description	Example
Time	Serial date number	7.345540013888888e+5 (2/20/2011, 12:02 am)
nodeHid	Node (power strip) identifier (1-15)	4
channelNumber	Channel (receptacle) identifier (0-3)	0
powerAvg	Average power draw over 1 minute interval	9.42
powerMin	Minimum power draw over 1 minute interval	9.35
powerMax	Maximum power draw over 1 minute interval	9.50
powerSum	Summation of power counts received by data server over 1 minute interval	565.08
numMeasurements	Number of measurements received by data server over 1 minute interval (Note: powerAvg = powerSum / numMeasurements)	60

A summary description of the plug loads is provided in the table below. A channel is labeled as nodeHid.channelNumber, e.g., 1.0 refers to node 1, channel 0. The "location" is a logical grouping that was used for analysis purposes only and does not necessarily indicate the physical location. For example, 8.0 and 8.1 were at the same physical location but assigned to different groups. The "schedule-based control off hours" indicates the hours for which the channel was commanded to be off (de-energized)

during the controlled testing period. The policy changes indicate modifications to energy saver settings, also during the controlled testing period. Note that not all of the policy changes were effective; for example, some of the desktop computers rarely, if ever, went to standby mode. The schedule-based control and policy changes were not applied at the same time for all devices. Some initial tests were done and then a final rule set was put in place for several weeks. We suggest the following date ranges for the uncontrolled and controlled periods of testing:

Uncontrolled: 1/27/2011 – 3/6/2011
Controlled: 6/1/2011 – 8/6/2011

Ch	Device	Location	Schedule-based Control Off Hours	Policy Changes
1.0	Desktop Computer	Workstation 1	No Rules	
1.1	Personal Printer	Workstation 1	10 pm – 6 am	
1.2	Phone	Workstation 1	10 pm – 6 am	
1.3	Speakers	Workstation 1	10 pm – 6 am	
2.0	Personal Printer	Workstation 2	10 pm – 6 am	
2.1	Laptop Computer	Workstation 2	10 pm – 6 am	
2.2	Scanner	Workstation 2	10 pm – 6 am	
2.3	Phone	Workstation 2	10 pm – 6 am	
3.0	Desktop Computer	Workstation 2	No Rules	Time to standby set to 3 hr
3.1	Monitor	Workstation 2	10 pm – 6 am	Screen saver set to black, time to standby set to 10 min
3.2	Ethernet Hub	Workstation 2	10 pm – 6 am	
3.3	(Empty)	Workstation 2		
4.0	Shared Black-and-White Printer	Copy Room	No Rules	Time to standby changed from 4 hrs to 1
4.1	Shared Color Printer	Copy Room	10 pm – 6 am	Time to standby changed from 4 hrs to 1
4.2	(Empty)			
4.3	(Empty)			
5.0	Shared Copier	Copy Room	No Rules	
5.1	Shredder	Copy Room	10 pm – 6 am	
5.2	(Empty)			
5.3	(Empty)			
6.0	Laptop Computer	Workstation 3	10 pm – 6 am	
6.1	Monitor	Workstation 3	10 pm – 6 am	
6.2	Speakers	Workstation 3	10 pm – 6 am	
6.3	External Drive	Workstation 3	10 pm – 6 am	
7.0	Coffee Maker	Break Room	10 pm – 6 am	

| 7.1	Refrigerator	Break Room	No Rules	
7.2	(Empty)			
7.3	Bridge		No Rules	
8.0	Microwave	Break Room	10 pm – 6 am	
8.1	Shredder	Workstation 4	10 pm – 6 am	
8.2	(Empty)			
8.3	(Empty)			
9.0	Desktop Computer	Workstation 4	6 pm – 5:30 am	
9.1	Desktop Computer	Workstation 4	6 pm – 5:30 am	
9.2	Monitor	Workstation 4	6 pm – 5:30 am	
9.3	Speakers	Workstation 4	6 pm – 5:30 am	
10.0	Scanner	Workstation 4	6 pm – 5:30 am	
10.1	Lava Lamp	Workstation 4	6 pm – 5:30 am	
10.2	Shredder	Workstation 4	6 pm – 5:30 am	
10.3	Personal Printer	Workstation 4	6 pm – 5:30 am	
11.0	Desktop Computer	Workstation 5	No Rules	Time to standby set to 3 hr
11.1	Monitor	Workstation 5	No Rules	Time to standby changed from 3 hrs to 15 min
11.2	Personal Printer	Workstation 5	8 pm – 7:30 am	
11.3	Calculator	Workstation 5	8 pm – 7:30 am	
12.0	Desktop Computer	Workstation 6	No Rules	Time to standby set to 3 hr
12.1	Monitor	Workstation 6	10 pm – 6 am	
12.2	Monitor	Workstation 6	10 pm – 6 am	
12.3	External Drive	Workstation 6	No Rules	
13.0	Personal Printer	Workstation 6	10 pm – 6 am	
13.1	Scanner	Workstation 6	10 pm – 6 am	
13.2	USB Hub	Workstation 6	10 pm – 6 am	
13.3	Battery Charger	Workstation 6	No Rules	
14.0	Food Vending Machine	Break Room	10 pm – 6 am	
14.1	Drink Vending Machine	Break Room	10 pm – 6 am	
14.2	(Empty)			
14.3	(Empty)			
15.0	Laptop Computer	Workstation 7	10 pm – 6 am	
15.1	Monitor	Workstation 7	10 pm – 6 am	
15.2	Space Heater	Workstation 7	10 pm – 6 am	
15.3	Light	Workstation 7	10 pm – 6 am	

There are known anomalies in the data. Due to channel communication problems, some commands to turn devices on or off did not go through. For instance, here is an example where the channel should have been off at 10 pm to 6 am but was not (green plusses):
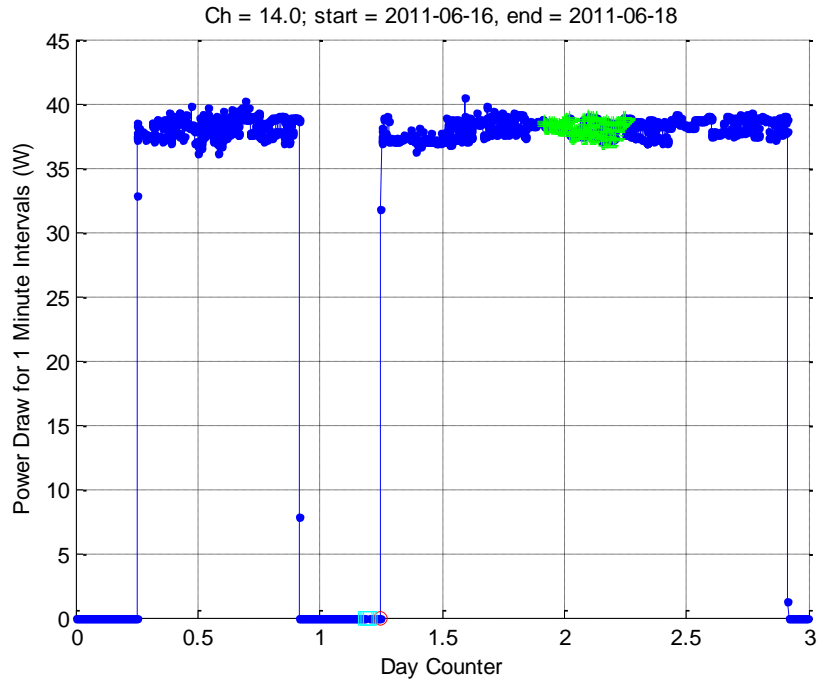
Here is another example where a device was expected to be on but was off (red circles; cyan squares indicate missing data):
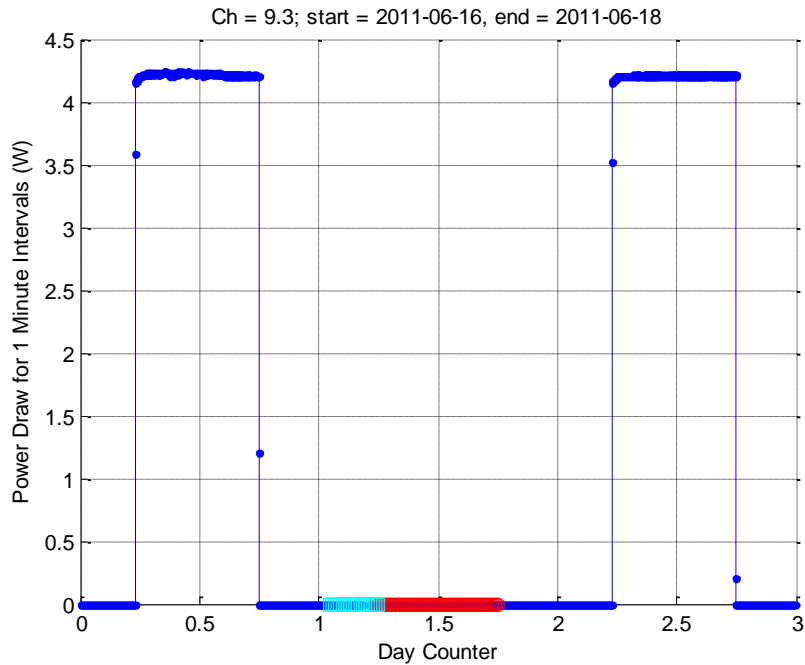
Here is an example where the copier did not transition from idle to standby mode after 1 hr of inactivity as set by the energy saver policies (red plusses after ~3 pm):

Ch 5.0; 2011-06-28
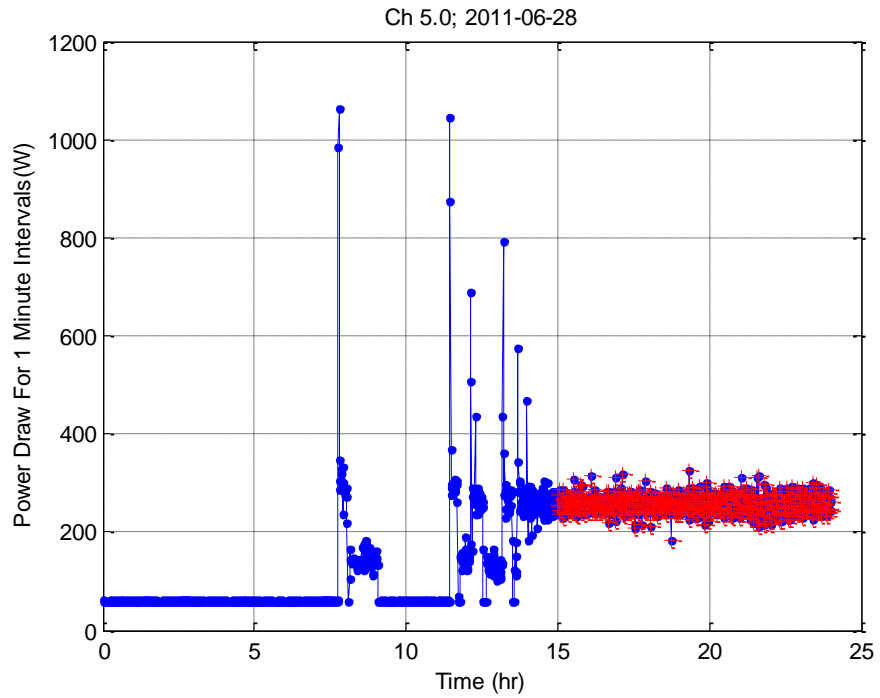
Here is an example where a different device was plugged into the channel (red plusses):

Ch 9.1; start = 2011-07-18, end = 2011-08-06
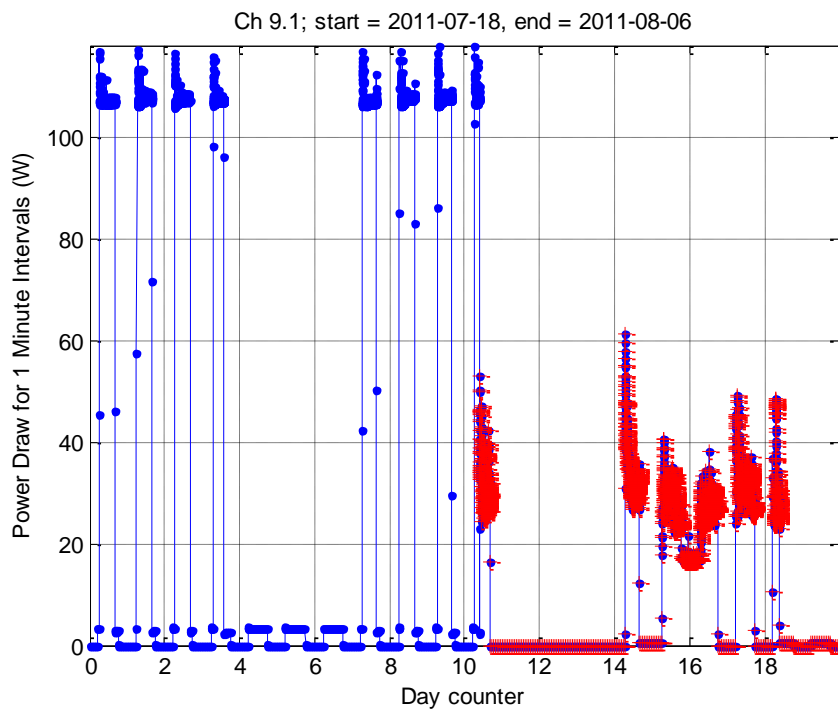
These are a few examples. However, we do not provide labeled (nominal/anomalous) data. More discussion will be provided in upcoming publications.